PATENT
Atty Docket No.: 200205522-1

In The U.S. Patent and Trademark Office

In Re the Application of:

Inventor(s):	Doron Shaked	**Confirmation No.:**	5923
Serial No.:	10/675,944	**Examiner:**	Jeffrey S. Smith
Filed:	October 2, 2003	**Group Art Unit:**	2624
Title:	A METHOD TO SPEED-UP RETINEX-TYPE ALGORITHMS		

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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I hereby certify that this correspondence is being transmitted to the Patent and Trademark Office facsimile number (571) 273-8300 on February 4, 2008. This correspondence contains the following document(s):

1 sheet of Transmittal of Appeal Brief (2 copies).

24 sheets of Appeal Brief-Patents.

Respectfully submitted,

MANNAVA & KANG, P.C.

February 4, 2008

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PATENT APPLICATION

ATTORNEY DOCKET NO. 200205522-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Doron SHAKED

Application No.: 10/675,944

Filing Date: October 2, 2003

Confirmation No.: 5923

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Group Art Unit: 2624

Title: A METHOD TO SPEED-UP RETINEX-TYPE ALGORITHMS

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TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on Dec. 3, 2007.

☒ The fee for filing this Appeal Brief is $510.00 (37 CFR 41.20).

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $460	☐ 3rd Month $1050	☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 510. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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Rev 10/07(Apblbrf)

02/05/2008 VBUI11 00000037 082025 10675944
01 FC:1402 510.00 DA

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Attorney Docket No.: 200205522-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Doron SHAKED	**Confirmation**	5923
U.S. Serial No.:	10/675,944	**Examiner:**	Jeffrey S. Smith
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For: A METHOD TO SPEED-UP RETINEX-TYPE ALGORITHMS

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APPEAL BRIEF - PATENTS

Sir:

This is an Appeal Brief in connection with the decision of the Examiner in a Final Office Action dated September 4, 2007. This Appeal Brief is hereby submitted within 2 months of the filing of the Notice of Appeal, which was filed on December 3, 2007 because February 3, 2008 is a weekend day.

Each of the topics required in an Appeal Brief and a Table of Contents are presented herewith and labeled appropriately.

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(1) **Real Party In Interest**

The real party in interest is Hewlett-Packard Development Company, L.P.

(2) **Related Appeals And Interferences**

There are no other appeals or interferences related to this case.

(3) **Status Of Claims**

Claims 1-12, 14-20, 22, and 23 are pending in the present application.

Claim 22 is allowed.

Claims 4-12 and 16-20 are objected to but have been indicated as being allowable if rewritten to include all of the limitations of the base claim and any intervening claims.

Claims 1-3, 14, 15, and 23 stand rejected.

Pursuant to 37 C.F.R. § 41.37, the Appellants hereby appeal the Examiner's decision finally rejecting Claims 1-3, 14, 15, and 23 to the Board of Patent Appeals and Interferences. Therefore, Claims 1-3, 14, 15, and 23 of this application are at issue on this appeal.

(4) **Status of Amendments**

No amendment was filed subsequent to the final Office Action dated September 4, 2007.

A copy of the claims at issue on appeal is attached as the Claims Appendix.

(5) **Summary Of Claimed Subject Matter**

Claims 1 and 14 are the independent claims at issue in this appeal.

Claim 1

Claim 1 pertains to an apparatus for speeding up Retinex-type processing of an input image. *Specification*, page 3, lines 26 and 27. (The apparatus comprises the modules 110, 120, 140, and 180 shown in FIG. 3). The apparatus includes a down-sampling module (110) configured to produce one or more sub-sampled images of the input image. *Specification*, page 5, lines 28-31. The apparatus also includes a non-linear illumination estimation module (120) that receives the sub-sampled images and produces corresponding interim illumination estimations. *Specification*, page 5, lines 31-33. The apparatus further includes an up-sampling module (140) configured to receive the input image and to interpolate the interim illumination estimations to produce an illumination estimation by using the input image as a guide in the interpolation, and wherein the illumination estimation is usable to perform a Retinex-type correction to the input image. *Specification*, page 6, lines 25-33.

Claim 14

Claim 14 pertains to a method for speeding up Retinex processing of a high resolution input image. *Specification*, page 3, lines 26 and 27. (The method comprises the processes that the modules 110, 120, 140, and 180 shown in FIG. 3 perform). In the method, one or more low resolution input images are produced by sub-sampling the high resolution input image. *Specification*, page 5, lines 28-31. In addition, an interim illumination estimation is generated for each of the one or more low resolution input images. *Specification*, page 5,

lines 31-33. Moreover, an illumination estimation suitable for Retinex-type correction is generated by up-sampling the interim illumination estimations, wherein generating the illumination estimation comprises combining the input image and the interim illumination estimations. *Specification*, page 5, lines 33-page 6, line 1. Still further, a Retinex-corrected output from the combined input image and the illumination estimation is produced. *Specification*, page 6, lines 1-4.

(6) Grounds of Rejection to be Reviewed on Appeal

Whether Claims 1-3, 14, 15, and 23 should have been rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 02/089062 to Kimmel et al. (hereinafter "Kimmel et al.") in view of the disclosure contained in the background section of the present Specification (hereinafter "admitted prior art") and further in view of U.S. Patent Application Publication No. 2004/0091164 to Sakatani et al. (hereinafter "Sakatani et al.").

Whether the "Requirement for Information" for information pertaining to any applications that are related to the present application should have been issued under 37 C.F.R. § 1.105.

Whether the drawings should have been objected to under 37 C.F.R. § 1.83(a) for failing to show features of Claims 14-20 and 22.

(7) Arguments

A. Claims 1-3, 14, 15, and 23

i. **The Examiner's Position**

With reference to the Final Official Action dated September 4, 2007 (hereinafter "Final Official Action"), the Examiner is of the opinion that it would have been obvious to a person having ordinary skill in the art to modify Kimmel et al. based upon the disclosure contained in the admitted prior art and Sakatani et al. The Examiner is also of the opinion that the proposed combination discloses all of the features claimed in Claims 1-13, 14, 15, and 23 and that these claims are therefore unpatentable.

Claims 1 and 23

The Examiner alleges that Kimmel et al. discloses "a non-linear illumination estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations." The Examiner argues that the claimed "non-linear illumination estimation module" is disclosed on page 3 of the Kimmel et al. document. (*Final Official Action*, page 5, par. 4). The Examiner also asserts that Kimmel et al. fails to disclose a down-sampling module, an up-sampling module, and an illumination manipulation module. (*Final Official Action*, page 5, par. 5).

In an effort to make up for this deficiency in Kimmel et al., the Examiner attempts to rely upon the admitted prior art. More particularly, the Examiner points to Figure 2 of the present application, which depicts a prior art Retinex algorithm having a down sampling module 32, an up-sampling module 34, and an illumination manipulation module 180. The Examiner asserts that "it would have been obvious to one of ordinary skill in the art at the time of the invention to use the down-sampling, up-sampling and the illumination manipulation modules of the admitted prior art with the non-linear retinex algorithm of

Kimmel in order to speed up the computationally intensive retinex process, as taught in the admitted prior art on page 3 of the specification." (*Final Official Action*, page 5, last paragraph).

The Examiner also asserts that the disclosure, "'the resolution of the blurred image produced by the formula (7) is changed to match with the resolution of the original image $I_j(x,y)$ by interpolation"' in Sakatani et al. and that the disclosure "'using the high resolution input image S to select corresponding output pixels' when 'the interpolation is performed on a set of smooth, low resolution intermediate images"' in the admitted prior discloses "an up-sampling module that uses the input image as a guide in the interpolation for the benefit of performing Retinex type processing." (*Final Official Action*, page 6, pars. 1-3).

Claims 2 and 3

In rejecting Claim 2, the Examiner merely asserts that the admitted prior art "discloses that the up-sampling module is configured to implement an interpolation routine." (*Final Official Action*, page 6, par. 4). The Examiner does not assert here that the "interpolation routine" discussed in the admitted prior art "receives the interim illumination estimations and a sampling rate, and produces the illumination estimation." The Examiner also does not provide any further arguments regarding how Kimmel et al. could possibly be modified to include the up-sampling module discussed in the admitted prior art. The Examiner further does not provide any possible motivation for the desirability of including such an up-sampling module in Kimmel et al.

Claim 14

The Examiner alleges that "Kimmel discloses producing one or more low resolution input images by sub-sampling the high resolution input image, generating an interim illumination estimation for each of the one or more low input resolution images, and producing a Retinex corrected output." (*Final Official Action*, page 6, par. 5). In setting forth this assertion, the Examiner does not cite to any particular section in Kimmel et al. Thus, it is unclear where in Kimmel et al. the Examiner believes the purported features are disclosed.

In addition, the Examiner does not particularly point out which features of Claim 14 Kimmel et al. fails to disclose. Instead, the Examiner merely cites to the admitted prior art again for its alleged disclosure of "producing one or more low resolution input images (32), generating an interim illumination estimation (30), generating an illumination estimation suitable for Retinex type correction by up-sampling (34) and combining the input image and the interim illumination estimation (20)." (*Final Official Action*, page 6, last paragraph). The Examiner also asserts that the disclosure, "'the resolution of the blurred image produced by the formula (7) is changed to match with the resolution of the original image $I_j(x,y)$ by interpolation'" in Sakatani et al. and that the disclosure "'using the high resolution input image S to select corresponding output pixels' when 'the interpolation is performed on a set of smooth, low resolution intermediate images'" in the admitted prior art discloses generating "the illumination estimation by combining the input image and the interim illumination." (*Final Official Action*, page 7, pars. 1 and 2).

Claim 15

In rejecting Claim 15, the Examiner merely asserts that page 3 of Kimmel et al. "discloses an illumination estimation that comprises local maximum routine." (*Final Official Action*, page 7, par. 3). The Examiner does not assert here that interim illumination estimations and a sampling rate are received to produce the illumination estimation nor that an envelope requirement is enforced by applying a local maximum routine as claimed in Claim 15.

ii. **Discussion of the Law**

The test for determining if a claim is rendered obvious by one or more references for purposes of a rejection under 35 U.S.C. § 103 is set forth in *KSR International Co. v. Teleflex Inc.*, 550 U.S._, 82 USPQ2d 1385 (2007):

> "Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." Quoting *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966).

As set forth in MPEP 2143.03, to ascertain the differences between the prior art and the claims at issue, "[a]ll claim limitations must be considered" because "all words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385. According to the Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in view of *KSR International Co. v. Teleflex Inc.*, Federal Register, Vol. 72, No. 195, 57526, 57529 (October 10, 2007), once the *Graham* factual inquiries are resolved, there must be a determination of whether the claimed invention would

have been obvious to one of ordinary skill in the art based on any one of the following proper rationales:

> (A) Combining prior art elements according to known methods to yield predictable results; (B) Simple substitution of one known element for another to obtain predictable results; (C) Use of known technique to improve similar devices (methods, or products) in the same way; (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (E) "Obvious to try"—choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art; (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. *KSR International Co. v. Teleflex Inc.*, 550 U.S._, 82 USPQ2d 1385 (2007).

Furthermore, as set forth in *KSR International Co. v. Teleflex Inc.*, quoting from *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006), "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasonings with some rational underpinning to support the legal conclusion of obviousness."

Therefore, if the above-identified criteria and rationales are not met, then the cited reference(s) fails to render obvious the claimed invention and, thus, the claimed invention is distinguishable over the cited reference(s).

iii. **The Appellant's Position**

Claims 1-3 and 23

The Examiner improperly asserts that Kimmel et al. discloses "a non-linear estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations". Instead, on page 3, Kimmel et al. merely discusses an iterative algorithm having a "reset" non-linearity that enforces a constraint. In addition, assuming that

the Examiner has interpreted the estimator 14 as the claimed "non-linear illumination estimation module", the estimator 14 does not receive sub-sampled images. Instead, as disclosed in the second full paragraph on page 2 of Kimmel et al., the estimator 14 receives a logarithmic version 13 of an input image S 11. The estimator 14 is not equivalent to the claimed non-linear illumination estimation module at least because it does not receive sub-sampled images nor produces interim illumination estimations corresponding to the sub-sampled images. As such, Kimmel et al. fails to explicitly disclose a non-linear illumination estimation module as claimed in Claim 1 of the present invention.

Even assuming for the sake of argument, however, that the estimator module 14 of Kimmel et al. is equivalent to a non-linear estimation module as asserted by the Examiner, the proposed modification of Kimmel et al. to include the down-sampling module 32, the up-sampling module 34, and the illumination manipulation module 20 of the admitted prior art depicted in Figure 2 of the present application is without merit. Basically, the Examiner has argued that it would have been obvious to replace the logarithmic module 12, the summer 18, and the expander 20 in Kimmel et al. with the down-sampling module 32, the up-sampling module 34, and the illumination manipulation module 20 of the admitted prior art. On its face, it appears that the estimator module 14, which the Examiner has apparently argued as being equivalent to the claimed non-linear illumination estimation module, would not perform its intended function if its input is changed from the down-sampling module 32 to the logarithmic module 12. In fact, it is unknown whether the proposed modification to Kimmel et al. wouldn't entirely defeat its intended purpose.

In addition, the output of the estimator module 14 would undoubtedly change from the proposed modification resulting in the greater likelihood that the intended purpose of Kimmel et al. would be defeated.

For at least the foregoing reasons, it is respectfully submitted that a person of ordinary skill in the art would not have been motivated to combined Kimmel et al. with the admitted prior art as suggested by the Examiner.

Assuming for the sake of argument again that Kimmel et al. discloses a non-linear estimation module as asserted by the Examiner, the proposed modification of Kimmel et al. based upon the discussion contained in the admitted prior art and the disclosure contained in paragraph 118 of Sakatani et al. fail to make up for other deficiencies in Kimmel et al. More particularly, neither the admitted prior art nor Sakatani et al. discloses an up-sampling module that receives an input image and uses the input image as a guide in interpolating interim illumination estimations to produce an illumination estimation useable to perform a Retinex-type correction to the input image, as claimed in Claim 1 of the present invention.

Paragraph 118 of Sakatani et al. recites that the resolution of the original and blurred images are matched with each other to execute a Single Scale Retinex calculation. More particularly, that paragraph states that the resolution of a blurred image is changed to match the resolution of an original image by interpolation. As such, Sakatani et al. discloses that the resolutions of images are matched with each other and thus does not disclose that interim illumination estimations are interpolated to produce an illumination estimation by using an input image as a guide in the interpolation. As such, the proposed combination of Kimmel et al. and Sakatani et al. fails to disclose all of the features of independent Claim 1.

The Examiner's discussion from the admitted prior art regarding "'using the high resolution input image S to select corresponding output pixels' when 'the interpolation is performed on a set of smooth, low resolution intermediate images'" pertains to illumination manipulation module 20 and not to the up-sampling module 34. This is clearly evidenced in Figure 2, which depicts the high resolution images L'' and the high resolution input image S being inputted into the illumination manipulation module 20. As such, that cited passage of the admitted prior art also fails to disclose an up-sampling module that is configured to interpolate interim illumination estimations to produce an illumination estimation by using an input image as a guide in the interpolation.

For at least the foregoing reasons, it is respectfully submitted that the proposed combination of Kimmel et al., the admitted prior art, and Sakatani et al. fails to disclose each and every element claimed in Claims 1-3 and 23 of the present invention. Accordingly, assuming only for the sake of argument that one of ordinary skill in the art were somehow motivated to combine these disclosures as suggested by the Examiner, the proposed combination would fail to disclose all of the features of the claimed invention. Clearly, therefore, the proposed combination fails to teach or suggest all of the claimed elements, and thus, the Examiner has failed to establish a *prima facie* case of obviousness based upon these documents.

Claims 14 and 15

The Examiner asserts that Kimmel et al. discloses "producing one or more low resolution input images by sub-sampling the high resolution input image, generating an interim illumination estimation for each of the one or more low input resolution images, and

producing a Retinex corrected output." The Examiner is silent as to which sections of Kimmel et al. are relied upon as disclosing these features.

For at least this reason, the rejection of Claim 14 is improper and should be withdrawn.

In any event, however, assuming for the sake of argument that Kimmel et al. discloses the features discussed above, the proposed modification of Kimmel et al. based upon the discussion contained in the admitted prior art and the disclosure contained in paragraph 118 of Sakatani et al. fail to make up for other deficiencies in Kimmel et al. More particularly, neither the admitted prior art nor Sakatani et al. discloses the step of generating an illumination estimation suitable for Retinex-type correction by up-sampling interim illumination estimations, where the step of generating includes combining the input image and the interim illumination estimations, as claimed in Claim 14 of the present invention.

Paragraph 118 of Sakatani et al. recites that the resolution of the original and blurred images are matched with each other to execute a Single Scale Retinex calculation. More particularly, that paragraph states that the resolution of a blurred image is changed to match the resolution of an original image by interpolation. As such, Sakatani et al. discloses that the resolutions of images are matched with each other and thus does not disclose that interim illumination estimations are up-sampled by combining the input image and the interim illumination estimations. As such, the proposed combination of Kimmel et al. and Sakatani et al. fails to disclose all of the features of independent Claim 14.

The Examiner's discussion from the admitted prior art regarding "'using the high resolution input image S to select corresponding output pixels' when 'the interpolation is performed on a set of smooth, low resolution intermediate images'" pertains to manipulation

of the high resolution images L'' and not to generation of an illumination estimation. This is clearly evidenced in Figure 2, which depicts the high resolution images L'' and the high resolution input image S being inputted into the illumination manipulation module 20. As such, that cited passage of the admitted prior art also fails to disclose the step of generating an illumination estimation suitable for Retinex-type correction by up-sampling interim illumination estimations as claimed in Claim 14.

For at least the foregoing reasons, it is respectfully submitted that the proposed combination of Kimmel et al., the admitted prior art, and Sakatani et al. fails to disclose each and every element claimed in Claims 14 and 15 of the present invention. Accordingly, assuming only for the sake of argument that one of ordinary skill in the art were somehow motivated to combine these disclosures as suggested by the Examiner, the proposed combination would fail to disclose all of the features of the claimed invention. Clearly, therefore, the proposed combination fails to teach or suggest all of the claimed elements, and thus, the Examiner has failed to establish a *prima facie* case of obviousness based upon these documents.

B. Requirement for Information

The Examiner asserts that the Applicant and the assignee of this application are required under 37 CFR 1.105 to provide information that the examiner has determined is reasonably necessary to the examination of this application. More particularly, the Examiner has requested information pertaining to any application that claims the benefit of priority to the present application or to PCT/US2004/032295.

This is an uncommon request and does not seem justified. Initially, it should be noted that the Examiner provided no justification for this request. In fact, it is not at all clear as to what information the Examiner is seeking to uncover with this request if the Applicant has complied with the duty of disclosure under 37 C.F.R. § 1.56. In addition, this request is inappropriate because it has first been presented in the Final Official Action.

In response to the Requirement for Information, the undersigned submits that the Applicant and the assignee are unaware of any application that claims priority to the present application or to PCT/US2004/032295 at the time that the present Appeal Brief is being submitted.

C. Drawing Objections

It is respectfully submitted that the Examiner erred in objecting to the drawings as allegedly failing to show every feature specified in the claims. Specifically, the Examiner erred by asserting that the method steps of Claims 14-20 and 22 are not shown in the figures, thus requiring corrected drawing sheets, because the figures, as originally filed, do show all of the steps claimed in Claims 14-20 and 22. The claimed steps are clearly shown in Figures 3, 4a, 4b, 5a-5c, 7a, and 7b. As such, the Appellant should not be required to submit new drawings to show the method steps of Claims 14-20 and 22. Detailed examples of the steps shown in the Figures 3, 4a, 4b, 5a-5c, 7a, and 7b are provided in the following paragraphs.

Figure 3 shows a block diagram in which a plurality of arrows depict the flow of data from one module to another. In this regard, Figure 3 can reasonably be interpreted as depicting a flow or process diagram, with the steps claimed in Claims 14-20 and 22 depicted in the diagram. This interpretation is further supported by the fact that the modules depicted

in Figure 3 are described on pages 5 and 6 of the Specification in terms of their respective functions and how data is processed by each of the modules. Figures 4a, 4b, 5a-5c, 7a, and 7b also show flow or process diagrams that more specifically define some of the processes described with respect to Figure 3.

To further illustrate that Figure 3 should be interpreted as depicting the steps contained in Claim 14, the steps claimed in Claim 14 will now be described with reference to Figure 3 and its accompanying description in the Specification. Regarding the step of "producing one or more low resolution input images...", the high resolution input image is depicted and disclosed with the letter "S", which is inputted into the down-sampling module 110, "which receives the input signal S and performs down-sampling according to a down-sampling algorithm to produce one or more sub-sampled images S'." *Specification*, page 5, lines 28-31. In addition, with respect to the step of "generating an interim illumination estimation...", the sub-sampled images S' are depicted as being inputted into the non-linear illumination estimation module 120, "which produces an interim illumination estimation L' for each of the sub-sampled images S'." *Specification*, page 5, lines 31-33.

Moreover, with respect to the step of "generating an illumination estimation...", the interim illumination estimations L' are depicted as being input into an up-sampling module 140, "which uses an up-sampling algorithm (not shown in Figure 3) to produce a full size illumination estimation L''," wherein the input image is combined with the interim illumination estimations. *Specification*, bridging sentence of pages 5 and 6 and page 6, lines 31-33.

Furthermore, Figure 3 shows the step of producing a Retinex-corrected output ("R") from the combined input image (S) and the illumination estimation L'. The combination of

input image (S) and the illumination estimation L' is clearly shown as the arrows labeled "S" and "L'" in Figure 3. *Specification*, page 6, lines 1-4.

With respect now to Claim 15, it is further respectfully submitted that Figures 3 and 4a, collectively, depict the subject matter claimed therein. This is clearly evidenced by the disclosure contained in lines 7-10 on page 7 of the *Specification*. That section, more particularly, describes, with reference to Figure 4a, that "when the estimated illumination L is an envelope rather than an average...the envelope constraint is enforced using the maximum routine 154."

With respect to Claim 16, the steps claimed therein are depicted in Figure 4b, which shows a method in which one or more low resolution images and the interim illumination estimations are subtracted by the adder 153, where the differences are inputted into an interpolation module 152, and the illumination estimation and the input image are added by the adder 155. *Specification*, page 7, lines 11-20.

With respect to Claim 17, the steps claimed therein are depicted in Figures 5a-5c. More particularly, Figure 5a depicts a difference interpolated illumination estimation, Figure 5b depicts an illumination interpolated illumination, and Figure 5c depicts an average of the curves depicted in Figures 5a and 5b. *Specification*, page 7, line 21 to page 8, line 2.

With respect to Claim 18, the steps claimed therein are depicted in Figure 7a. More particularly, Figure 7a shows that weighting factors (W_D) and (W_I) are respectively applied to the different interpolation difference interpolation and the illumination interpolation. *Specification*, page 9, lines 1-5.

With respect to Claim 19, the steps claimed therein are also depicted in Figure 7a.

With respect to Claim 20, the steps claimed therein are depicted in Figure 7b. More particularly, Figure 7b shows that a different interpolation module 150" is implemented and that an illumination interpolation weighting factor module 150' is applied. *Specification*, page 9, lines 6-8.

With respect to Claim 22, Figure 3 shows all of the steps claimed therein as discussed above with respect to Claim 14. In addition, Figure 7a shows the step of averaging the illumination interpolated illumination estimation and the difference interpolated illumination estimation to produce the illumination estimation.

For at least the foregoing reasons, it is respectfully submitted that the drawings of the present application clearly show all of the features claimed in Claims 14-20 and 22 and that the Examiner therefore erred in requiring corrected drawings to show these features.

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(8) Conclusion

For at least the reasons given above, the rejections of Claims 1-3, 14, 15, and 23 are improper. Accordingly, it is respectfully requested that such rejections by the Examiner be reversed and these claims be allowed. Attached below for the Board's convenience is an Appendix of Claims 1-3, 14, 15, and 23 as currently pending.

It is also respectfully requested that the Requirement for Information be deemed unnecessary and that it be withdrawn.

It is further respectfully requested that the objections to the drawings set forth by the Examiner be reversed.

Please grant any required extensions of time and charge any fees due in connection with this Appeal Brief to deposit account no. 08-2025.

Respectfully submitted,

Dated: February 4, 2008 By

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PATENT

Atty Docket No.: 200205522-1
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(9) Claim Appendix

1. An apparatus for speeding up Retinex-type processing of an input image, comprising:

a down-sampling module configured to produce one or more sub-sampled images of the input image;

a non-linear illumination estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations;

an up-sampling module configured to receive the input image and to interpolate the interim illumination estimations to produce an illumination estimation by using the input image as a guide in the interpolation, and wherein the illumination estimation is usable to perform a Retinex-type correction to the input image.

2. The apparatus of claim 1, wherein the up-sampling module is configured to implement an interpolation routine that receives the interim illumination estimations and a sampling rate, and produces the illumination estimation.

3. The apparatus of claim 2, wherein the up-sampling module is further configured to enforce an envelope constraint.

14. A method for speeding up Retinex processing of a high resolution input image, comprising:

producing one or more low resolution input images by sub-sampling the high resolution input image;

generating an interim illumination estimation for each of the one or more low resolution input images;

generating an illumination estimation suitable for Retinex-type correction by up-sampling the interim illumination estimations, wherein generating the illumination estimation comprises combining the input image and the interim illumination estimations; and

producing a Retinex-corrected output from the combined input image and the illumination estimation.

15. The method of claim 14, wherein generating an illumination estimation further comprises:

receiving the interim illumination estimations and a sampling rate to produce the illumination estimation; and

enforcing an envelope requirement by applying a local maximum routine.

23. The apparatus of claim 1, further comprising an illumination manipulation module, wherein the input image and the illumination estimation are combined to produce an output image.

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(10) **Evidence Appendix**

None.

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(11) Related Proceedings Appendix

None.